

## *Remote Sensing Devices Fact Sheet*

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The Remote Sensing Device (RSD) measures and records the exhaust emissions of vehicles as they drive by, along with vehicle license plate numbers and other important information.

### **How does the Remote Sensing Device work?**

The RSD system detects vehicle emissions when a car drives through an invisible light beam that the RSD system projects across a roadway. The process of measuring emissions remotely begins when the RSD's Source/Detector Module (SDM) sends an infrared (IR) and ultraviolet (UV) light beam across a single lane of road to a Transfer Mirror Module (TMM). The TMM reflects the beam back across the street (creating a dual beam path) into a series of detectors in the SDM. These detectors convert the IR/UV energy into an electrical signal—the greater the IR/UV energy detected, the higher the electrical signal level and the lower the emission reading. Exhaust gases from dirtier cars absorb more of the signal.

The RSD system detects hydrocarbons (HC), carbon monoxide (CO) and carbon dioxide (CO<sub>2</sub>) using the IR light, and Oxides of Nitrogen (NO<sub>x</sub>) using UV. Fuel specific concentrations of HC, CO, CO<sub>2</sub> and NO<sub>x</sub> are measured in the vehicle exhaust plumes based on their absorption of IR/UV light in the dual beam path. For example, the more CO in the vehicle's exhaust gas, the more infrared energy at the CO wavelength that gets absorbed and the less energy in this region the detector sees. Therefore, the electrical signal is proportional to the gas concentration.

### **What equipment is required?**

The RSD uses an IR/UV Source/Detector Module to emit the beam of IR/UV energy which crosses the traffic lane to the TMM. The beam is placed at the proper height to intersect the vehicle's exhaust plume.

The system uses a high-resolution, high-speed video camera to take a photograph of the rear of the vehicle, including its license plate, while the exhaust gas measurements are being taken. The license plate and the emissions readings are also displayed on a video monitor which can be observed by an operator.

- The video image is digitized and decoded using an optical character recognition (OCR) system that automatically identifies, reads, and merges the license plate number with the vehicle's exhaust emissions readings.
- The system uses a known calibration gas at frequent intervals to calibrate the sensor to maintain its accuracy.
- The system has features that detect the vehicle's mode of operation (such as speed and acceleration/deceleration) at the time the exhaust emissions are measured.
- The system uses a vehicle counter device to keep track of the total traffic flow.
- A computer system is used to control the entire process and record all data collected.